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The Genus *Mirax* (Hymenoptera, Braconidae, Miracinae) from Japan

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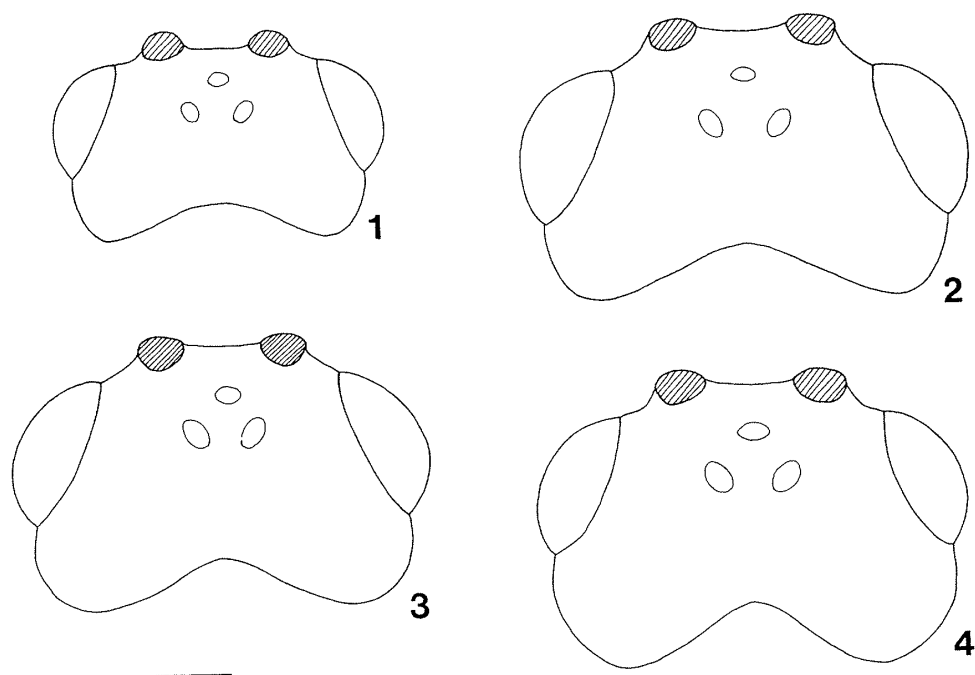
Abstract Four species of the genus *Mirax* are reported from Japan. *M. irruptor* PAPP and *M. mogrus* PAPP are newly recorded from Japan, and two new species are described: *M. kumatai* and *M. sii*. Three of them, *M. mogrus*, *M. kumatai* and *M. sii*, were all reared from leaf- or stem-miners of the *Acrocercops*-group, i. e., *Acrocercops*, *Dendrorhycter*, *Psydrocercops* or *Spulerina*, of the Gracillariidae. A key to the Japanese species is presented.

Key words: Braconidae; *Mirax*; parasitoid; leaf-miner; Gracillariidae; Japan.

The genus *Mirax* HALIDAY (including *Centistidea* ROHWER) is a small genus containing only 23 described species worldwide. The species are known to be solitary endoparasitoids of leaf-mining Lepidoptera including Nepticulidae, Tischeriidae, Heliozelidae, Lyonetiidae and Gracillariidae (SHAW & HUBLESTON, 1991; WHITFIELD & WAGNER, 1991). *Mirax* can be readily recognized by antenna with 12 flagellomeres, the absence of occipital carina, the absence of vein r-m of fore wing, vein SR of fore wing jointed or almost jointed with stigma and metasomal tergum 1 with spiracle on membranous laterotergite (NIXON, 1965). The genus occurs around the world, but it is rarely collected and thus no species has been recorded from Japan. In the East Palearctic Region, three *Mirax* species have been reported (PAPP, 1987; BELOKOBYLSKIY, 1989), though hosts of the species are unknown.

In this paper, I describe two new species from Japan and also record two species new to Japan, both are known from Korea and the Russian Far East. Three of them were exclusively reared from leaf- or stem-miners of the *Acrocercops*-group (Gracillariidae) reviewed by KUMATA *et al.* (1988 a, b).

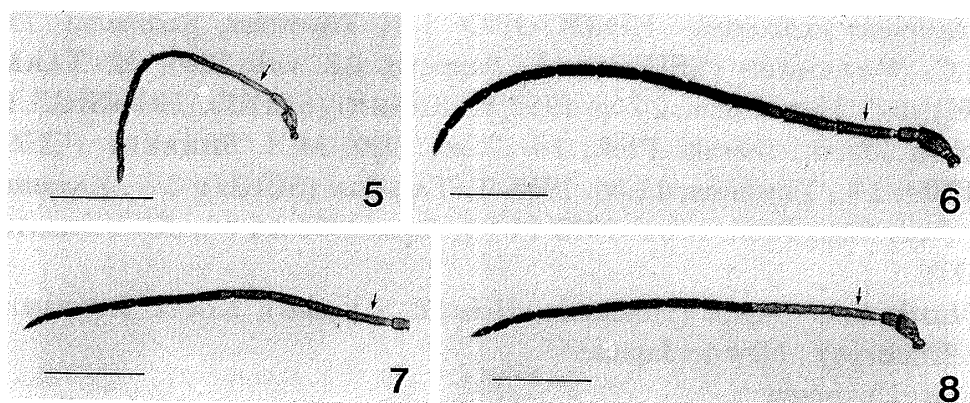
For the morphological terms used here, see HUBER & SHARKEY (1993). Abbreviations for collections are: CNCI, Canadian National Collection of Insects, Ottawa; ELKU, Entomological Laboratory, Kyushu University, Fukuoka; NIAES, Laboratory of Insect Systematics, National Institute of Agro-Environmental Sciences, Tsukuba; SEHU, Laboratory of Systematic Entomology, Hokkaido University, Sapporo.



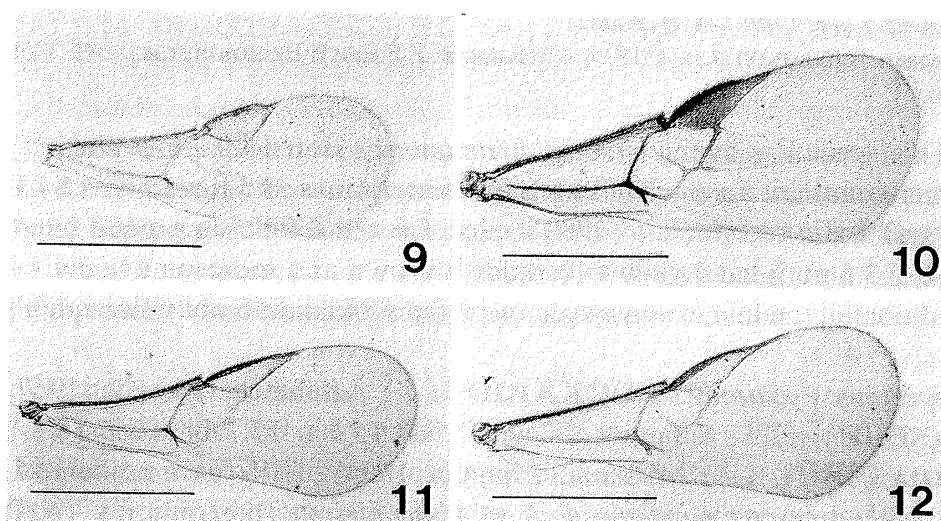
Figs. 1-4. Heads of *Mirax* spp., ♀, dorsal view — 1, *M. irruptor*, Saga; 2, *M. mogrus*, Nagano; 3, *M. kumatai*, holotype; 4, *M. sii*, holotype. Scale: 0.2 mm.

Key to Species of the Genus *Mirax* from Japan

1. Propodeum with smooth transverse area posteriorly, and the mediobasal longitudinal carina and transverse carina crossing each other (Fig. 13); head more transverse, 1.6–1.8 times as long as wide (Figs. 1, 2) 2
- Propodeum without smooth transverse area, bearing a complete median longitudinal carina and a trace of transverse carina (Fig. 14); head less transverse, 1.4–1.6 times as long as wide (Figs. 3, 4) 3
2. Flagellomere 1 long, 1.3–1.4 times as long as flagellomere 2 (Fig. 5); stigma without apical expansion (Fig. 9); body 1.0–1.9 mm long. *M. irruptor* PAPP
- Flagellomere 1 as long as flagellomere 2 (Fig. 6); stigma with a short but distinct apical expansion (? vein R1) (Fig. 10); body 1.6–2.5 mm long *M. mogrus* PAPP
3. Stigma without apical expansion (Fig. 11); dorsal length of eye 1.5–1.7 times temple (=the dorsal part of gena) (Fig. 3) *M. kumatai* sp. nov.
- Stigma with a long apical expansion (Fig. 12); dorsal length of eye about 1.1 times temple (Fig. 4) *M. sii* sp. nov.



Figs. 5–8. Antennae of *Mirax* spp., ♀ — 5, *M. irruptor*, Saga; 6, *M. mogrus*, Nagano; 7, *M. kumatai*, holotype; 8, *M. sii*, holotype. Arrow indicates flagellomere 1. Scale: 0.5 mm.



Figs. 9–12. Fore wings of *Mirax* spp., ♀ — 9, *M. irruptor*, Saga; 10, *M. mogrus*, Nagano; 11, *M. kumatai*, holotype; 12, *M. sii*, paratype. Scale: 1.0 mm.

Mirax irruptor PAPP

(Figs. 1, 5, 9)

Mirax irruptor PAPP, 1987, 446 (Korea).

Mirax irruptor: BELOKOBYLSKIJ, 1989, 40 (Russian Far East).

This species is characterized by the propodeum bearing a mediobasal longitudinal carina and a transverse carina crossing each other (cf. Fig. 13), the long flagellomere 1 (Fig. 5) and the stigma without apical expansion (Fig. 9). The specimens examined agree well with the descriptions and figures given by PAPP (1987) and BELOKOBYLSKIJ (1989), except for variations in the length of body (1.0–1.9 mm).

Specimens examined. HOKKAIDO: 1 ♀, Toyotomi, Sarobetsu, 2.viii. 1961, C. WATANABE (SEHU); 1 ♀, Sapporo, 27. viii. 1965, H. TAKADA (SEHU); 1 ♂, Tomakomai, 24. vi. 1959, K. KAMIJO (SEHU). HONSHU: 1 ♀, Tsuchiura Marsh, Ibaraki Pref., 16–27. x. 1989, M. J. SHARKEY (CNCI). KYUSHU: 2 ♀, Tsushima, 11. vi. 1965, T. TAKADA (SEHU); 2 ♀, Kamiozoe-gawa, Fuji, Saga Pref., 6. ix. 1973 (1 ♀), 9. x. 1973 (1 ♀), K. YAMAGISHI (ELKU).

Distribution. Japan (Hokkaido, Honshu, Kyushu); Korea; Russian Far East (Primorye). New to Japan.

Host. Unknown.

Mirax mogrus PAPP

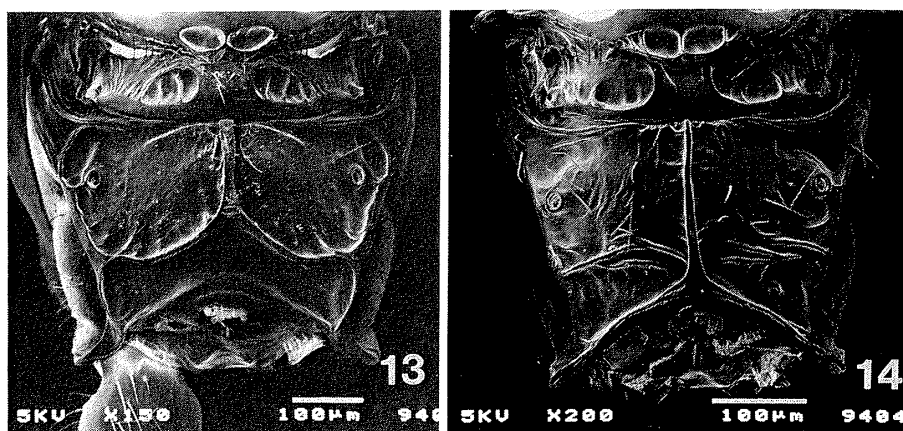
(Figs. 2, 6, 10, 13)

Mirax mogrus PAPP, 1987, 448 (Korea).

Mirax mogrus: BELOKOBYSKIY, 1989, 43 (Russian Far East); BELOKOBYSKIY, 1993, 55 (Vietnam).

This species is distinct from *M. irruptor* as noted in the key above. The specimens examined agree well with the descriptions and figures given by PAPP (1987) and BELOKOBYSKIY (1989), except for the following points: length of body 1.6–2.5 mm; head yellow to reddish brown and mesosoma usually brown at least dorsally, while in some specimens from Hokkaido body thoroughly light yellow.

Specimens examined. HOKKAIDO: 1 ♀, Ashibetsu, 15. viii. 1967, M. SUWA (SEHU); 13 ♀, Sapporo, 28. viii. 1964 (5 ♀), 27. viii. 1965 (8 ♀), H. TAKADA (SEHU), 1 ♂, Misumi, Sapporo, 16. vi. 1975, ex gracillarid stem-miner (= *Dendrorhycter marmaroides*) on *Alnus hirsuta* (breeding no. 1401), T. KUMATA (SEHU). HONSHU: 2 ♀, Nisinasuno, Totigi Pref., 3. vi. 1976, ex *Spulerina dissotoma* (breeding no. 1632), T. KUMATA (SEHU); 1 ♀, Tsuchiura Marsh, Ibaraki Pref., 2–16. x. 1989, M. J. SHARKEY (CNCI); 1 ♀, Tsukuba Expo Site, Ibaraki Pref., 29. viii. 1989, M. J. SHARKEY (NIAES); 8 ♀ 1 ♂, Hukusima, Nagano Pref., 29. vii–(no date). viii. 1975, ex *Spulerina* sp. (= *S. parthenocissi*) on *Parthenocissus tricuspidata* (breeding no. 1426), T. KUMATA (SEHU; NIAES); 2 ♀, Shimashima-dani (900–1300 m), Nagano Pref., 25. viii. 1978, K. MAETÔ (NIAES); 1 ♀, Nachi, Wakayama Pref., 21. ix. 1965, H. TAKADA (SEHU); 1 ♀, Kyoto, 7. ix. 1965, H. TAKADA (SEHU); 1 ♂, Kyoto, 2. vi. 1967, ex *Acrocercops* sp. on *P. tricuspidata*, T. KUMATA (SEHU); 1 ♀, Kibune, Kyoto, 6. viii. (19)80, C. M. YOSHIMOTO (CNCI); 1 ♀ 1 ♂, Taishaku, Tojo, Hiroshima Pref., 9. viii. 1978, K. MAETÔ (NIAES); 1 ♂, same locality and date, K. YAMAGISHI (ELKU). KYUSHU: 2 ♀ 1 ♂, Mt. Hiko, 700 m, Fukuoka Pref., 18–26. viii. 1989 (1 ♀), 25. viii–4. ix. 1989 (1 ♀ 1 ♂), MT., K.



Figs. 13–14. Propodeums of *Mirax* spp., dorsal view, ♀ — 13, *M. mogrus*, Nagano; 14, *M. kumatai*, paratype.

TAKENO & M. SHARKEY (CNCI, NIAES); 2 ♀ 4 ♂, Kamiozoegawa, Fuji, Saga Pref., 5. vi. 1973 (1 ♀ 2 ♂), 10. viii. 1973 (1 ♀ 2 ♂), K. YAMAGISHI (ELKU).

Distribution. Japan (Hokkaido, Honshu, Kyushu); Korea; Russian Far East (Primorye); Vietnam. New to Japan.

Hosts. *Dendrorhycter marmaroides* KUMATA, *Spulerina dissotoma* (MEY-RICK) and *S. parthenocissi* KUMATA et KUROKO (Lepidoptera, Gracillariidae).

Mirax kumatai sp. nov.

(Figs. 3, 7, 11, 14)

Female. Length of body 1.6–2.0 mm, of fore wing 2.0–2.4 mm, and of antenna 1.6–2.1 mm.

Head 1.5–1.6 times as wide as long and 1.2–1.3 times wider than mesonotum; temple (=the dorsal part of gena) roundly narrowed posteriorly in dorsal view (Fig. 3); dorsal length of eye 1.5–1.7 times temple; distance between lateral ocelli 2.5–3.0 times distance between lateral ocellus and eye, and equal with length of lateral ocellus; height of face 0.6–0.7 times distance between eyes; inner margin of eyes subparallel; malar space as long as basal width of mandible; head shiny with indistinct punctures; first flagellomere 5.0–6.0 times as long as wide, and about 1.1 times longer than flagellomere 2 (Fig. 7); penultimate flagellomere 2.5–2.8 times as long as wide; apical flagellomere pointed.

Mesosoma 1.3–1.5 times as long as high; mesoscutum shiny with indistinct punctures, rugulose anteriorly; notauli only anteriorly impressed and finely crenulate; prescutellar furrow distinct as a narrow groove; scutellum smooth and shiny, with posterior foveae; propodeum faintly rugulose with a complete median longitudinal carinae, strong lateral longitudinal carinae and a trace of

transverse carina (Fig. 14); mesopleuron polished without sternalus; metacoxa smooth; metafemur (excluding trochantellus) 3.5–3.8 times as long as wide.

Stigma without apical expansion, about thrice longer than wide, vein *r* issuing somewhat proximally from its middle (Fig. 11); vein *M* of fore wing 1.3–1.5 times longer than vein *m-cu*; vein 1/*Cu* of fore wing as long as vein 2/*Cu*.

Median tergite 1 of metasoma 3.0–3.5 times as long as its maximum width; hypopygium moderately pointed; length of ovipositor sheath about 0.1 times fore wing.

Yellow to dark yellow; antenna brown; mesosoma and metasoma brown or dark brown dorsally; palpi and legs light yellow (except for metatibia apically and metatarsus brownish); wings hyaline, stigma light brown.

Male. Unknown.

Holotype: ♀, SEHU, "Kozagawa, Wakayama-k., Honsyu, Japonia", "18/X, 1974. em., T. KUMATA", "Host 1326, *Acrocercops* sp. on *Wisteria floribunda*", "*Psydrocercops wisteriae* (KUROKO)".

Paratypes: 13 ♀, same locality, collector and host as holotype, 12–23. x. 1974 (SEHU, NIAES).

Distribution. Japan (Honshu).

Host. *Psydrocercops wisteriae* (KUROKO) (Lepidoptera, Gracillariidae).

Remarks. This new species is similar to *M. sculpturator* BELOKOBYLSKIY from the Russian Far East in having the propodeum with a complete median longitudinal carina (BELOKOBYLSKIY, 1989), but is readily distinguished from the latter by the round temple in dorsal view (Fig. 3), the propodeum without strongly developed transverse carina (Fig. 14), the tergite 1 of metasoma longer than three times its maximum width and the small body size.

Mirax sii sp. nov.

(Figs. 4, 8, 12)

Female. Length of body 1.8–2.0 mm, of fore wing 2.2–2.4 mm, and of antenna 2.0–2.2 mm.

Head 1.4–1.5 times as wide as long and 1.2–1.3 times wider than mesonotum; temple (=the dorsal part of gena) roundly narrowed posteriorly in dorsal view (Fig. 4); dorsal length of eye about 1.1 times temple; distance between lateral ocelli 2.0–2.5 times distance between lateral ocellus and eye, and equal with length of lateral ocellus; height of face 0.5 times distance between eyes; inner margin of eyes subparallel; malar space 1.3 times longer than basal width of mandible; head shiny with indistinct punctures; first flagellomere 5.0–6.0 times as long as wide, and 1.0–1.1 times longer than flagellomere 2 (Fig. 8); penultimate flagellomere 2.5–3.0 times as long as wide; apical flagellomere

pointed.

Mesosoma 1.4 times as long as high; mesoscutum shiny with indistinct punctures, finely rugulose anteriorly; notauli only anteriorly impressed and finely crenulate; prescutellar furrow distinct as a narrow groove; scutellum smooth and shiny, with posterior foveae; propodeum smooth with a complete median longitudinal carinae, strong lateral longitudinal carinae and a trace of transverse carinae (cf. Fig. 14); mesopleuron polished without sternaulus; metacoxa smooth; metafemur (except for trochantellus) 3.6–3.8 times as long as wide.

Stigma with a long and slender apical expansion (? vein R1), 3.0–3.4 times longer than wide, vein r issuing from its middle (Fig. 12); vein M of fore wing 1.3–1.5 times longer than vein m-cu; vein 1/Cu of fore wing as long as vein 2/Cu.

Median tergite 1 of metasoma 3.0–3.5 times as long as its maximum width; length of ovipositor sheath about 0.1 times fore wing.

Yellow to dark yellow; antenna brown; mesonotum tinged with brown; propodeum and metasomal terga 3–7 dark brown; palpi and legs (except for metatibia apically and metatarsus brownish) light yellow; wings hyaline, stigma light brown.

Male. Length of body 2.3 mm, of fore wing 2.6 mm; stigma brown.

Holotype: ♀, SEHU, "Kozagawa, Wakayama-k., 20–VI–1970", "Honsyu, T. KUMATA", "Host 1035, *Acrocercops* sp. on *Castanopsis cuspidata*", "*Acrocercops melanoplecta* MEYRICK".

Paratypes: 1♂, same locality, collector and host as holotype, 10. vi. 1970; 2♀, same locality and collector as holotype, 20. ix–23. x. 1974, ex *Acrocercops* sp. on *Castanopsis cuspidata* (breeding no. 1285). All in SEHU.

Distribution. Japan (Honshu).

Host. *Acrocercops melanoplecta* MEYRICK (Lepidoptera, Gracillariidae).

Remarks. This new species is very similar to *M. kumatai* sp. nov., but *M. sii* can be separated by the stigma with a long apical expansion (Fig. 12) and relatively small eye in dorsal view (Fig. 4).

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